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no. 1

concrete construction

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This article describes how ordinary paper and masking tape can be used to advantage in concrete work as a time and labor-saving tool. Its use ranges from the protection of finished surfaces to the sharp separation of color.

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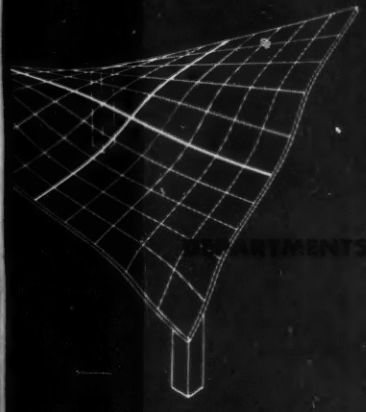

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THE HYPERBOLIC PARABOLOID

new thin shell roof type that promises great things.

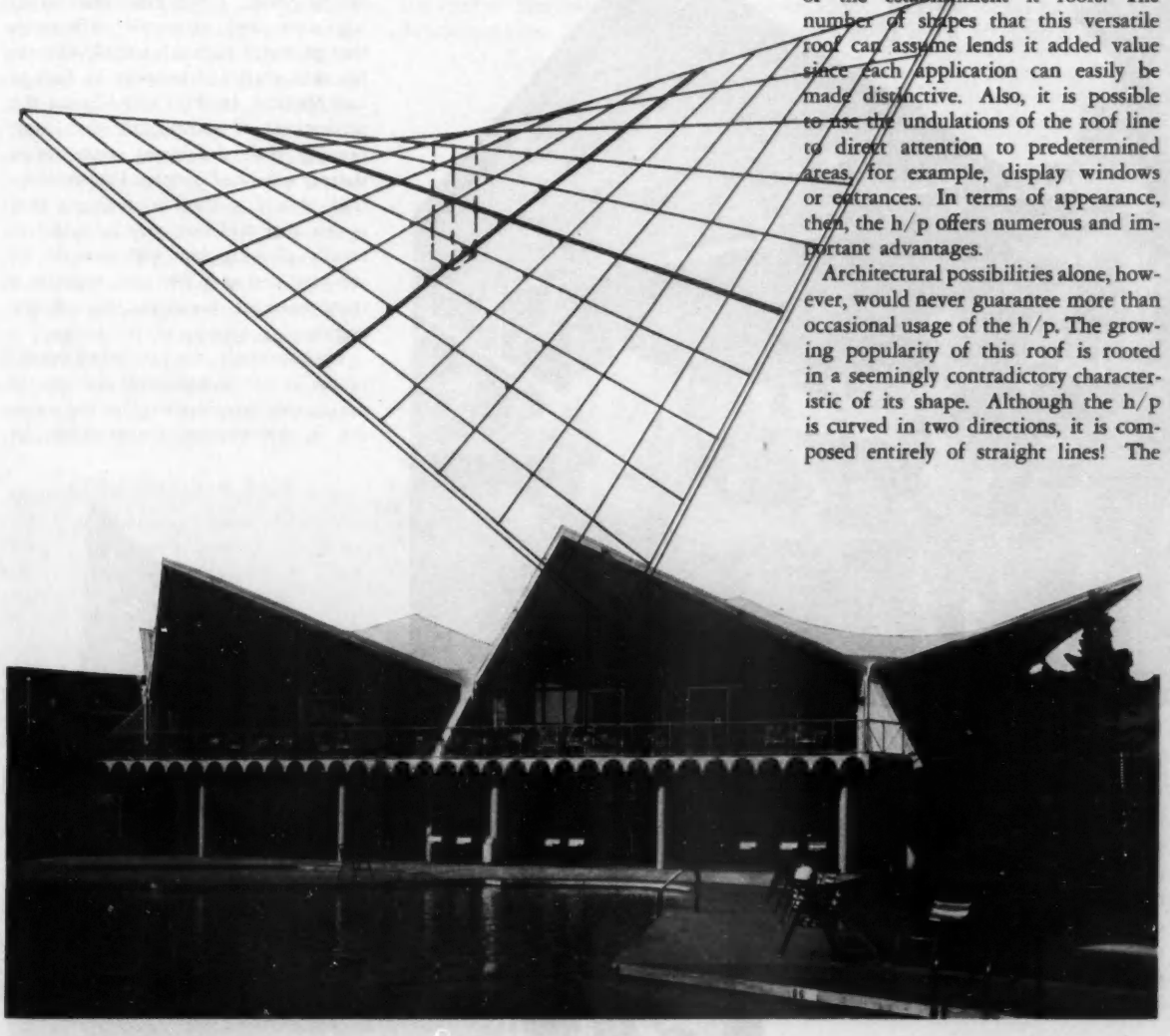
AT THE OUTSET of thin shell roof construction in the United States, it seemed that domes would be the order of the day for decorative applications and barrels for utilitarian buildings. Recently, however, a relative newcomer has made strong inroads in these markets. This up-and-coming thin shell roof type is the hyperbolic paraboloid.

As tongue-twisting as the name is, and as complex as the shape appears to be, the h/p offers many architectural and economic advantages over more conventional roof types.

APPEARANCE

It's easy to appreciate the visual impact that the h/p has upon passers-by. In sales buildings for strongly competitive retail businesses—department stores, restaurants, gas stations—its use catches the eyes of prospective customers and spells out the modernity of the establishment it roofs. The number of shapes that this versatile roof can assume lends it added value since each application can easily be made distinctive. Also, it is possible to use the undulations of the roof line to direct attention to predetermined areas, for example, display windows or entrances. In terms of appearance, then, the h/p offers numerous and important advantages.

Architectural possibilities alone, however, would never guarantee more than occasional usage of the h/p. The growing popularity of this roof is rooted in a seemingly contradictory characteristic of its shape. Although the h/p is curved in two directions, it is composed entirely of straight lines! The



accompanying drawings illustrate how this phenomenon is possible. Interesting but of what value, you say? This characteristic of the h/p spells outstanding savings in both construction materials and time, as well as engineering man hours.

ECONOMY

Imagine being able to roof an area of 200 square feet using a single column and a concrete slab only 1½ inches thick! This is the economy typical of the h/p. All thin shell roofs derive their strength through shape rather than mass. Great cantilevers and spans are possible with the h/p by reason of its doubly curved shape. Because of this double curvature, h/p roofs are exceptionally stiff, despite their thin cross-section, and they experience no bending. They are literally braced in two directions. This renders them much better equipped to handle unequal loading, whether dead loads, such as equipment hung from the ceiling, or live loads, for example, wind, rain or snow. It is also thought that the h/p will be especially useful in areas subject to earthquakes. Whereas ordinary roofs require considerable bulk and weight in construction materials to compensate for stresses, the h/p provides its own built-in bracing and can, therefore, make use of lightweight concrete and an extremely thin shell.

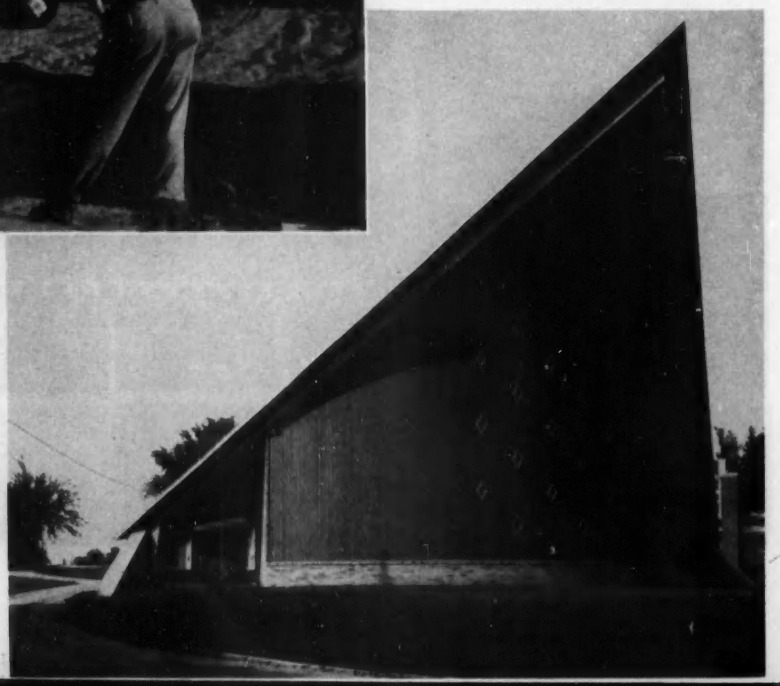
In foreign countries, where construction materials costs are relatively high when compared with workers' salaries, this saving in concrete alone is important enough to warrant optimism. With such different economic conditions in the United States, it is not significant enough, by itself, to assure adoption. It is by nature of the straight line composition characteristic of the h/p that the economies most telling in this country are achieved.

DESIGN SIMPLICITY

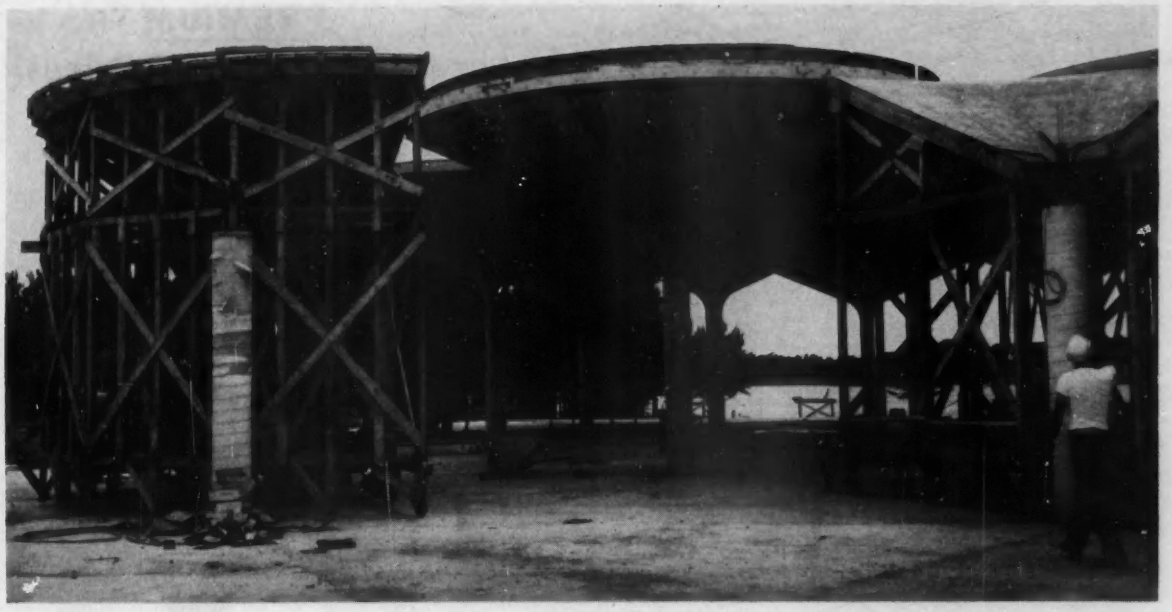
A major advantage of the h/p is the design simplicity which it offers. Because forces in thin shell roofs act in three dimensions, rather than in just two as in conventional post and lintel construction, their design is usually complex and laborious. However, the h/p can be analyzed by simple statics; it is the only three-dimensional shape of which this is true. This means it is much easier to understand its structural action and to prepare plans.

The foregoing advantage is more important than it might appear to be at first glance. It was more than building code and economic differences that provided such a favorable climate for thin shell construction in Europe and Mexico. In the United States the professions of architecture and engineering have for many years been sharply separated entities. Proper selection of a thin shell roof shape, that is one that will not only be architecturally pleasing but will also do its job well and at a low cost, requires a comprehensive understanding of the engineering aspects of its design.

Unfortunately, the prescribed curriculums in our architectural colleges do not provide extensive engineering training in conventional construction, let



The use of thin-shell construction for the roof of St. Edmunds Episcopal Church in Elm Grove, Wisconsin, was a major factor in holding down the total cost of this 4,000-square foot structure (including interior furnishings) to $92,000.



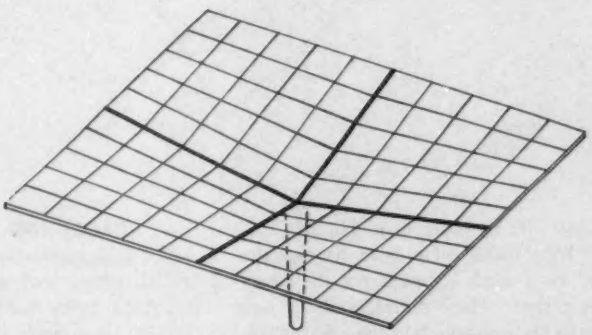
Here is another of the almost unlimited variations of the hyperbolic paraboloid. The roof of this restaurant is composed of 30-foot diameter cones mounted on slender columns. Note that the formwork and shoring at the left rides on casters.

alone thin shell roof design. European colleges aim at turning out graduate architect-engineers or engineer-architects, as the case may be. Significantly, the famous pioneers in thin shell work —Felix Candela of Mexico, Eduardo Torroja of Spain, Pier Luigi Nervi of Italy—are equally as well-known for their engineering prowess as for their architectural genius. In all fairness, it must be added that in the last few years there has been an encouraging increase in American architects who also have engineering degrees, and in combined architectural-engineering firms. Another encouraging factor is that the design simplicity of the h/p makes it a much less formidable shape than other thin shell roof types.

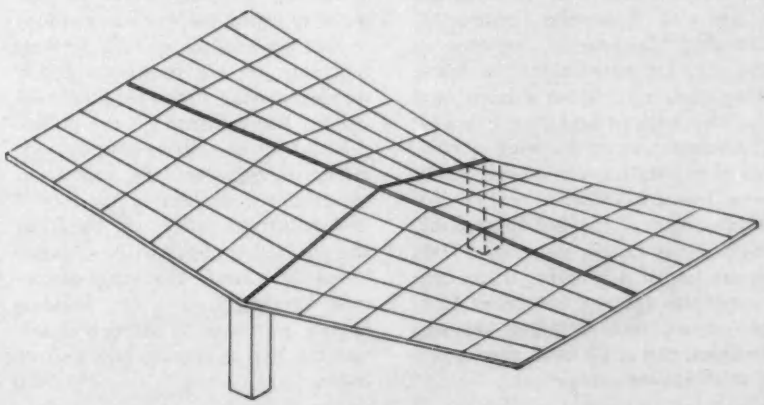
CONSTRUCTION EASE

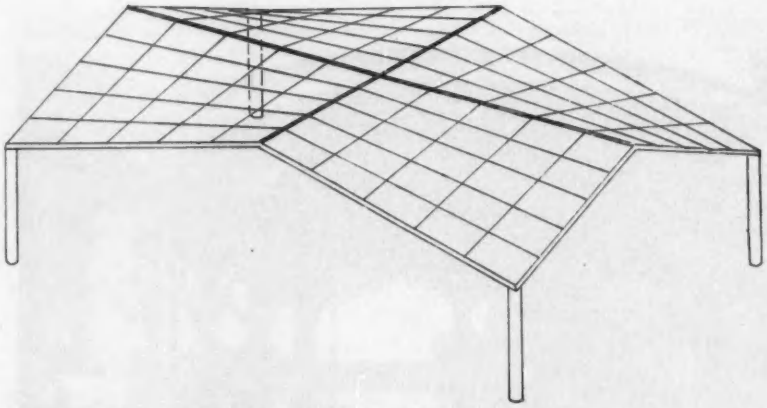
Another important plus offered by the h/p is relative construction simplicity. Thanks to its straight line characteristic, forms for the h/p can be built of straight lumber. Forms are usually the principal single factor in thin shell construction costs, so this bolsters the competitive position of the h/p in a vital area.

Even at this early stage, the h/p has several times illustrated its ability to compete successfully with conventional construction. The most striking example of this to date has been the Argentine Water Reservoir, Kansas City, Kansas. Four alternate designs were put out for bids—pre-stressed long-span channel slabs, pre-cast short-span channels, flat slab and h/p. The h/p bid was lower than the closest

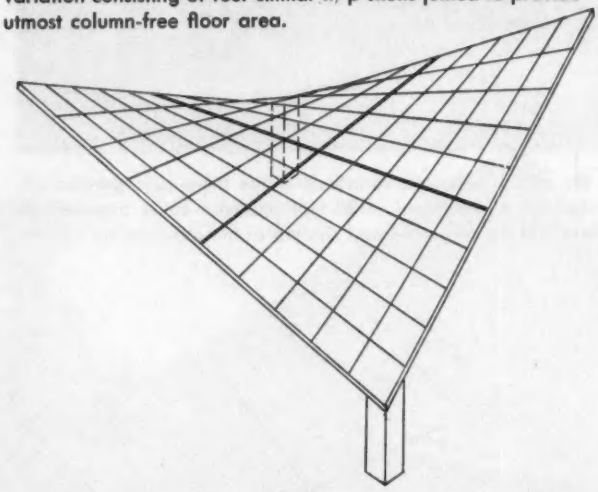


The straight line composition of the h/p can be readily seen in these drawings. (A straight-edge will prove the point!) A commonly used h/p shell is the umbrella-shaped form shown at the top. Below is one of the many variations possible. This variant is valuable when a considerable cantilever is required, e.g., in a park shelter or a band shell.





A basic h/p is the saddle-shaped figure below. Above, a variation consisting of four similar h/p shells joined to provide utmost column-free floor area.



contender by more than $20,000.

Four forms were built to cast the 52 h/p shells required for the reservoir roof. These forms were in two parts to accommodate the central column for the 46-foot square umbrella-shaped shells. After two days of steam curing (outside temperatures sank as low as 0 degrees F.) the dolly-mounted forms were simply lowered by winches and rolled to the position for the next h/p. Total cost for the forms amounted to less than 30 cents per square foot. Eastmount Construction Company, the general contractor on this job, has stated that "the whole thing came off without a hitch" and that they hope to land other h/p jobs.

Another project involving a number of h/p shells is at the Great Southwest Industrial District near Dallas, Texas. One of the industrial buildings in this development has 32,000 square feet of h/p shells. It has been figured that the roof cost under $1.00 per square foot including drainage facilities; this is 10 to 15 percent less than the closest competitor.

PROMISING FUTURE

We will inevitably see greater use of this novel roof as the design of free-form h/p thin shells becomes further simplified, and as architects grow increasingly familiar with their potential on a practical as well as an esthetic basis. Contractors will be able to use forms fabricated for previous jobs to lower costs even more. Prestressing of edge beams can be expected to increase spans. Construction details and procedures will be perfected to expedite operations and lower costs; for example, on the Argentine Reservoir job, the contractor greatly speeded moving forms by simply installing larger casters on the dollies.

Step-by-step, job-by-job, owners, architects, engineers and contractors are gaining confidence in the h/p as it demonstrates its beauty, versatility and practicality. So don't be surprised if you see butterfly-like wings of concrete hovering over a new building in your town soon. It will only signify that the h/p is coming into its own in your area. END

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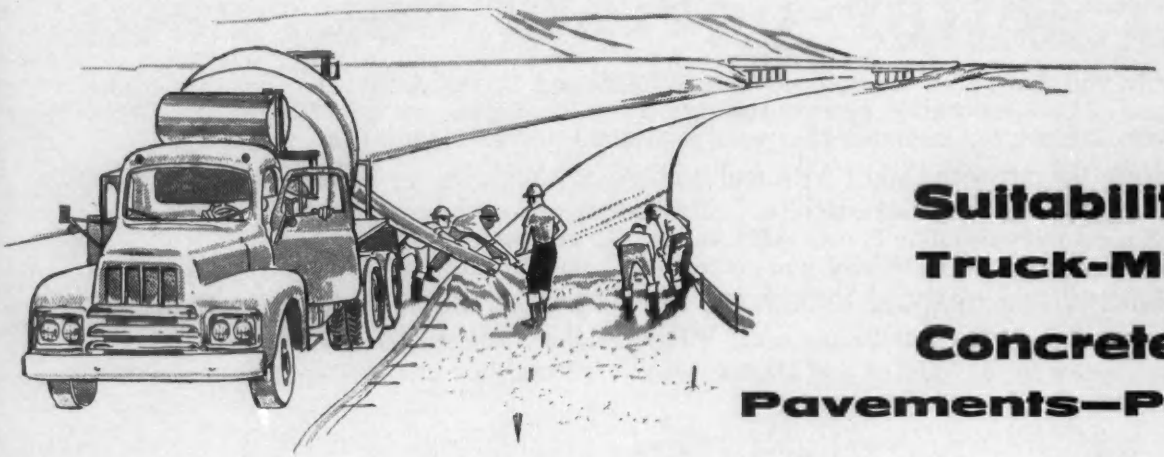


Suitability of Truck-Mixed Concrete for Pavements—Part 1

In this first article of a series the author discusses some of the basic factors which have held back the use of ready-mixed concrete in pavement work.

BY ALBERT G. TIMMS*

THE USE OF TRUCK MIXERS to make concrete for pavement construction has long been a subject of debate among contractors and the people responsible for the quality of pavements. The purpose of this series of articles is to discuss the suitability of truck mixers for producing pavement concrete and to explore the recent literature and reports of experience with truck-mixed concrete.

When streets, traffic circles, and pavement intersections adjacent to industrial cities are to be constructed of concrete, ready mix affords a means of combatting the serious problem of traffic congestion. These locations require heavy duty pavement and concrete is the ideal material. In these areas, because of the construction of sewer, water, and electrical facilities underneath the streets, it is often impractical to bring in the big pavers, and it is generally uneconomic to use such large units for a relatively small volume of work.

Truck-mixed concrete has been used extensively for structures related to paving, such as bridges and culverts, and for pavement widening projects but the volume being used in full-scale paving work is still not impressive. The general acceptance and widespread use of truck-mixed concrete for purposes other than pavement construction affords convincing evidence that producers have been successful in supplying a high quality material of satisfactory uniformity and in the required amounts at the time and place it was needed.

Several factors have tended to hold back acceptance of ready mixed concrete for use in highway pavements. Lack of suitable equipment, and lack of understanding of the equipment available, have been serious obstacles. Even the operating standards for truck mixers, based on methods and experience dating back to the early years of the industry, have not always been adequate to produce the quality of concrete desired.

Federal, State, and Municipal organizations have been reluctant to use truck mixers on projects requiring the concrete to be closely controlled for quality. The basis of this reluctance has been the absence of accurate information on how to produce quality controlled concrete with truck mixers. Until recently little was known of the factors in the manufacturing process that affect the uniformity of concrete. This whole picture, however, has undergone a radical change in recent years.

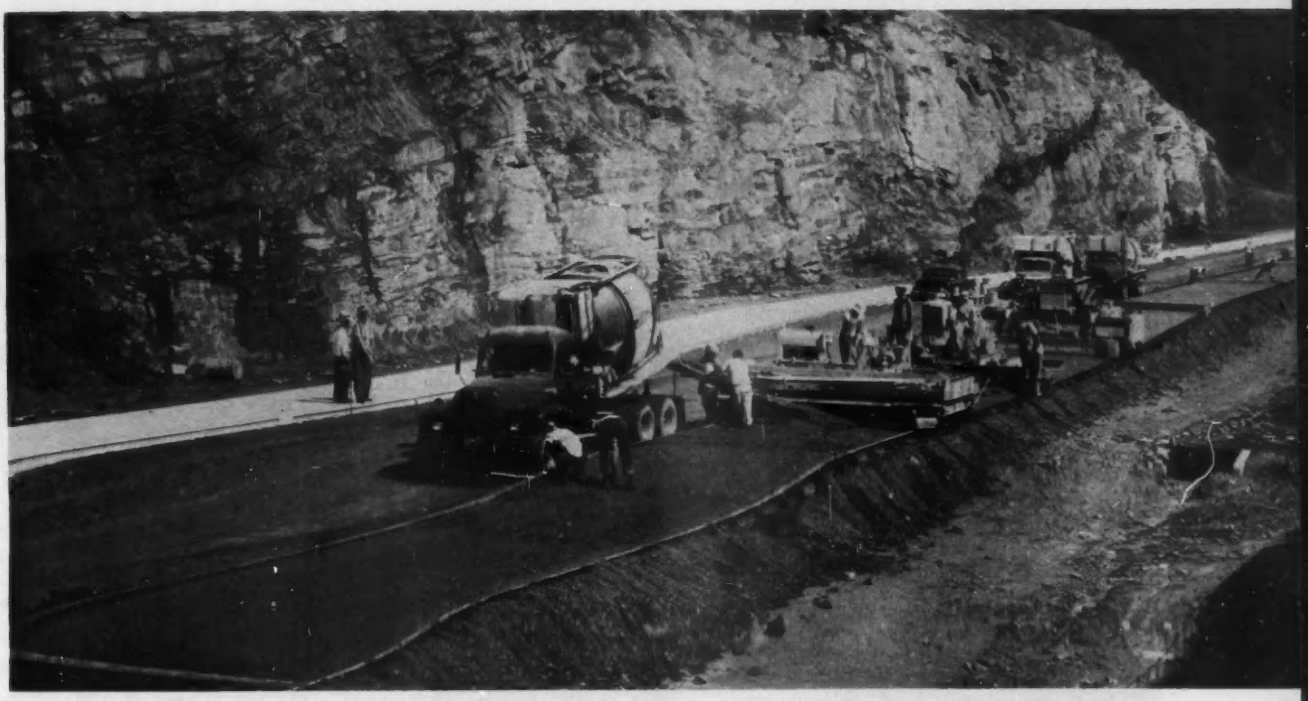
Let us examine the objection voiced by State and Federal highway engineers—that the quality of the concrete cannot be controlled satisfactorily. It is true that the type of concrete suitable for paving construction is more difficult to control than the type required for structures. Structural concrete usually contains from 4½ to 5½ sacks of cement per cubic yard, with aggregate graded up to ¾ or 1 inch maximum size, and a slump of about 3 to 6 inches. Pavement concrete contains 5½ to 6½ sacks of cement per cubic yard, with aggregate graded up to 2¼ inches maximum size and a slump of 1 to 2 inches; obviously far less mixing water is used.

It is a basic concept that the quality of concrete as measured by strength is determined by controlling the ratio of water to cement so long as the concrete is plastic and workable. The effective mixing water in a batch is received from two sources—the free surface moisture carried by the aggregates and the water added to the mix. It should be just as easy for the batching plant operator to determine the moisture contained in the aggregate for each truck-mixed batch as it is to determine the moisture in the aggregates in dry batches for use in pavers. Since he is usually required to do this, there should be no difficulty in determining the water content of the aggregate in the truck mixer, because the same general procedures are followed.

As to the water added to the mixer drum—can it be controlled? One of

*Consulting engineer on concrete problems. Formerly assistant manager, Research Laboratory of the Portland Cement Association, and more recently Head of the Concrete and Miscellaneous Unit of the Physical Research Branch of the Federal Bureau of Public Roads.

FILE: Paving



Truck-mixed concrete did a fine job of meeting quality requirements and keeping up with construction schedules on this 4-lane project in the Middle West.

the basic problems here is the difficulty of controlling water additions at the job site. This has come about because of human laziness rather than mechanical or hydraulic deficiencies in the equipment. How often do we see truck-mixed concrete being delivered to building foundations where the foreman keeps calling for more water so that the concrete will flow to the remote corners without any help from the workers? This practice has become so commonplace, and constitutes so serious a problem, that some ready mix operators, in order to help protect the good name of their product, require the driver to obtain the signature of the foreman of the project before he delivers more water than was specified. If truck mixers are to be used for paving, it may be desirable to add the mixing water to the drum at the plant only, and not even allow wash water to be carried by the mixer.

Accuracy of the water-measuring devices and difficulty in calibration have also come in for criticism. Walker and Bloem, in calibration tests of nine different concrete truck mixers at the National Ready Mixed Concrete Association, found that many of the gage glasses did not extend to the top of the tank and it was almost impossible to make an accurate initial reading without lowering the water level until it could be seen in the gage glass.

Here a ready-mix truck is discharging the very low-slump concrete that good pavement practice calls for. Designers of truck mixers are today giving a great deal of attention to some of the problems involved in mixing and discharging such low-slump concrete.

The use of truck-mixed concrete is on the upswing in airport construction work for both main runways and parking ramps. Here the mixers are delivering concrete for a 680-foot extension to a main runway.

The tilt of the truck also contributed to the difficulty. They also observed that there was considerable variation in the water meters or automatic cut-offs. While the matter of water measurement, in general, is not satisfactory as it now exists, a little demand from the users of concrete would most likely induce the manufacturers of mixers to improve the design and accuracy of their water-measuring equipment.

Still another criticism of truck mixers is summed up by this query: "How do we know when the concrete is mixed?" A good question. Should the number of revolutions of the drum be fixed, and if so how many should there be? Most specifications fix the minimum number of revolutions of the mixer drum at 50 or 75. In general, no limitation is placed on the maximum number permitted.* In the second article of this series the effects of rate and duration of mixing will be discussed in considerable detail.

Also, few mixers are equipped with revolution counters and until recently many of these counters have not operated with complete satisfaction. The National Ready Mixed Concrete Association has been cooperating with counter and switch manufacturers to improve the accuracy and durability of counters. Still another small handicap results from the fact that it is somewhat more difficult to tell when concrete is well mixed if the batches are relatively dry than when they have slumps of 5 inches or more.

There are also objections to dumping the concrete from the truck mixers directly on the subgrade, because the typical chute on most truck mixers tends to permit segregation of the ingredients as the concrete is deposited. It has been suggested the simple expedient of providing a baffle at the end of the chute will cause the concrete to drop vertically onto the subgrade, but an even more urgent need is to develop spreaders that will take the concrete from the truck mixer and distribute it over the subgrade.

In the next article of this series some of the factors that affect the uniformity of concrete will be discussed in the light of the experiences and tests conducted by the National Ready Mixed Concrete Association and those conducted for the Worthington Corporation.

To be continued in the February issue

*However, ASTM and other specifications do fix a limit (100) on the number of revolutions at mixing speed, and consideration is being given to the possibility of limiting the total number of revolutions.

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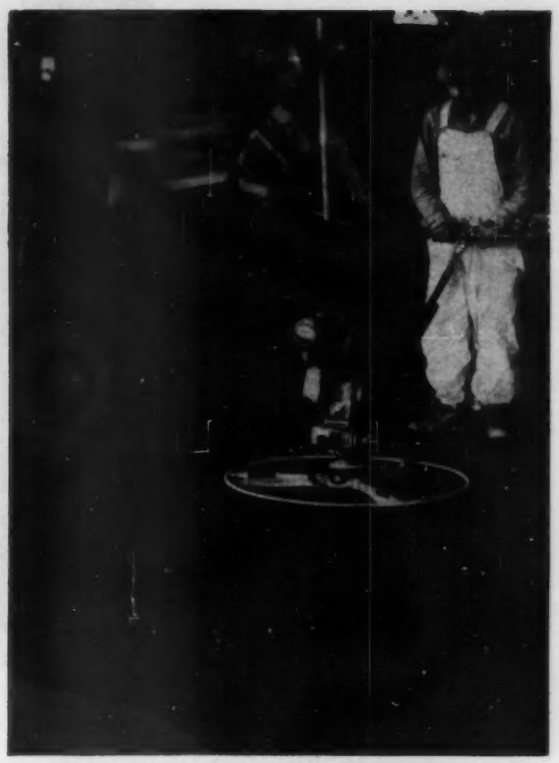

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Shown in this photo are preparations for pouring hollow concrete highway bridge beams. Voids are produced by filling the centers with "egg crate" paperboard cartons sealed with masking tape to prevent moisture from collapsing the boxes. Since the structural strength of the beam is provided by the prestressed steel imbedded in the walls, the center would only add excess weight if it were filled with concrete.

Within the expanding field of concrete construction, almost anything can happen in the way of new developments. Here is one of the latest.

PAPER TAPES FOR CONCRETE

AT FIRST GLANCE, it just doesn't seem to make sense that materials as fragile and inexpensive as paper and masking tape could be turned into helpful tools for working with a building material as heavy, massive, and dense as concrete. And yet various types of ordinary "Scotch" brand paper tape have actually been put to use in concrete construction work. The ways in which tape has been used, described below, certainly demonstrate that with a little ingenuity concrete builders can find any number of new jobs for an old product.

Perhaps the largest area for the use of tapes is with the different types of structural void construction in buildings. Where paperboard "egg crate" cartons are employed to create voids in floor slabs, paper tapes are used to seal flap seams on the bottom of cartons and all exposed corrugated edges.

The cartons normally are coated with wax to prevent moisture seepage from the wet concrete which would otherwise cause them to collapse or become malformed. However, unless the exposed edges on the box are sealed, moisture and laitance will seep into the carton.

Tapes have also been used in the construction of hollow concrete bridge beams. One firm designed a three-foot-wide variable depth concrete beam in which the center was filled with corrugated boxes, or honeycomb sections, which became a permanent part of the beam. Since the regular concrete beam gains its structural strength from prestressed strands embedded in its walls, much of the concrete used at the center only adds excess weight. Here again the problem of moisture was overcome by using three-inch-wide strips of tape to seal exposed edges and seams of the void units.

This technique of protective masking is also used by contractors in a manner very similar to the way painters employ masking tape for color separation.

A general contracting firm in Philadelphia uses miles of tape to mask finished concrete curbing and protect it from splashing when pouring fresh concrete in adjacent areas. The company had a contract to lay five miles of a new divided highway which called for the inclusion of a dividing strip with white reflective curbs. The scored curbings were laid first and the void was filled later with regular concrete. At first, the curbs were protected with a heavy kraft paper covering held in place with anything handy and heavy. During pouring of the center portion, workmen had to move these objects immediately ahead of the ready mix truck.

As an experiment to reduce both time and labor costs, the firm applied five-inch-wide strips of paper tape to each side of the scored curbings flush with the edge. The results were highly satisfactory as the tape protected the reflective surface from splashing and eliminated the need for bulky paper coverings or extra labor.

Another masking application involved the problem of maintaining a fine color separation when laying a two-color concrete floor. One Chicago firm had found it nearly impossible to eliminate some surface bleeding on jobs of that nature.

Where a red and white floor is laid, for example, the red colored concrete is poured first and allowed to cure for five days. Then the plain, or white, concrete is poured. Frequently the surface of the red concrete bleeds into the white, creating a fuzzy line which has to be sanded until a sharp line appears.

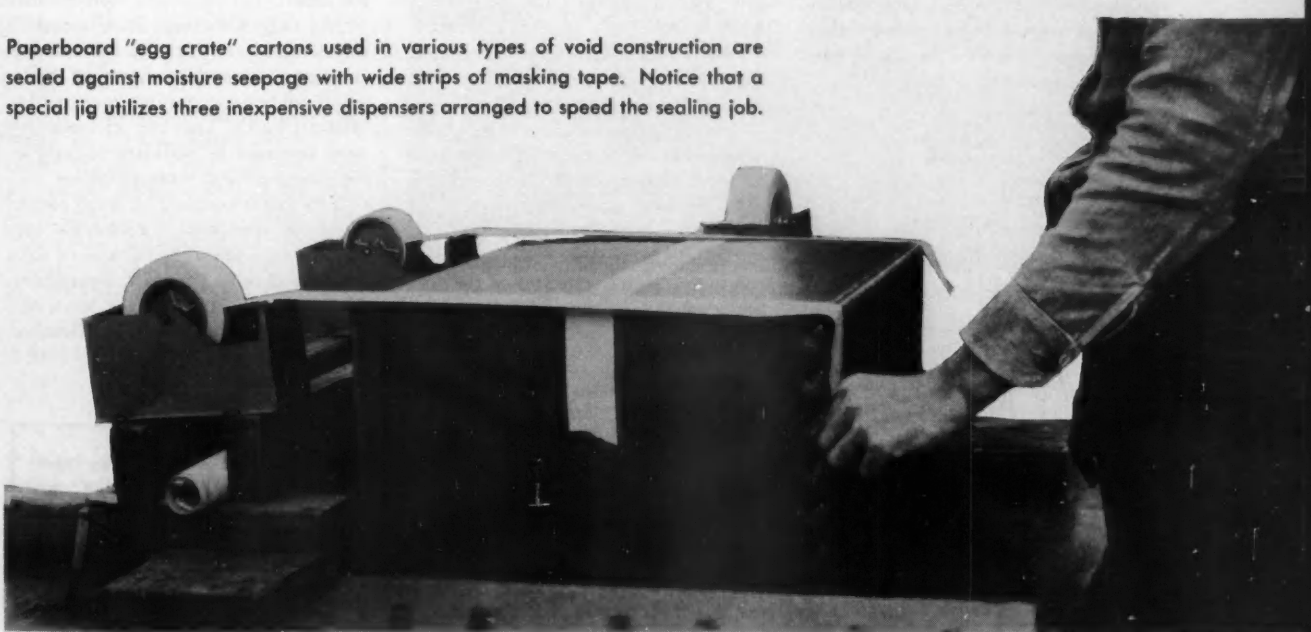
As a test, the Chicago contracting firm applied three-inch-wide strips of tape to the surface edge of the colored concrete before pouring the plain mix. A special aisle marker tape applicator was used to simplify the job of putting the tape down. The firm found that the tape eliminated all bleeding and gave a sharp line of demarcation. This is a trick painters have used for years.

A tape with adhesive on both sides (double-coated tissue tape that printers commonly use to hold printing and picture plates on mounting blocks) helped a Wichita, Kansas, firm with a design problem. The company specialized in tilt-up concrete industrial buildings in which the floor (laid and cured first) serves as the master mold for each wall which is later raised in place.

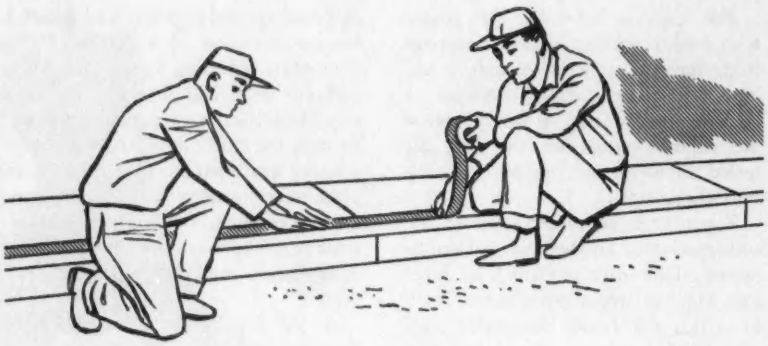
To break the monotony of the wide flat wall expanse, the company has been forming various grooved designs into each wall. The grooves are made by positioning narrow triangular wood slats on the floor before pouring the walls.

At first, slats were secured by nailing them to small wooden plugs set in the floor. Then, to eliminate the drilling of plug holes, this contracting firm tried taping the slats to the floor.

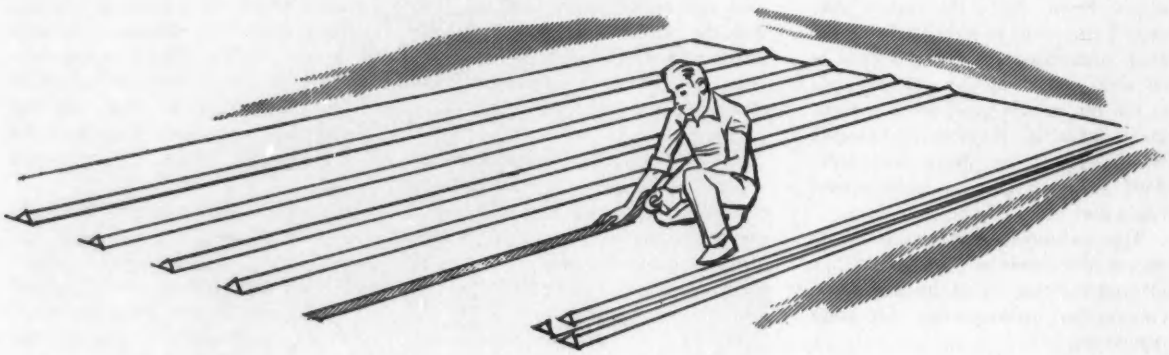
Paperboard "egg crate" cartons used in various types of void construction are sealed against moisture seepage with wide strips of masking tape. Notice that a special jig utilizes three inexpensive dispensers arranged to speed the sealing job.



RIGHT: A Philadelphia contractor used miles of masking tape to mask reflective curbings of a highway dividing strip. The tape protected the curbings from splashing when fresh concrete was placed next to hardened concrete.



BELOW: Triangular wood slats, used as a design technique to break the monotony of tilt-up walls, are held securely in position with "Scotch" brand double-coated tissue tape.



Surface color intermingling which occurs when laying a two-color concrete floor can be eliminated by applying three-inch-wide strips of "Scotch" brand masking tape along the edge of the cured section. An aisle lane marker tape applicator, such as the one shown in this sketch, simplifies the job of getting the tape down.

This proved unsatisfactory, and the firm then tried holding the slats with "Scotch" brand double-coated tape—with successful, time-saving results.

The tape, equipped with a removable liner to separate adhesive surfaces while in roll form, is placed with the exposed adhesive side to the floor. The liner is removed and the slat pressed firmly in place. Using one-inch-wide strips, all slats are positioned and the floor is sprayed with an agent to prevent the fresh concrete from bonding to the floor.

In addition to the time-saving factor, this Kansas firm found that the continuous bonding surface of the tape prevents the concrete from seeping under the slat and forming ragged edges.

These experiences with uses of ordinary paper and masking tape in concrete construction seem so far to add up to three important advantages: Tapes can be used to seal the edges of paper cartons employed to create structural voids, thus strengthening them against the danger of collapse from wet concrete; tapes can be used to mask finished concrete surfaces, thus protecting them from splashing when pouring fresh concrete; tapes can be used to construct two-colored concrete floors, since the masking application prevents one color from bleeding into the other.

Not only is the tape itself inexpensive and easy to apply in construction problems such as those described above, but it can become an important tool for eliminating the high cost of labor and time required by ordinary techniques for meeting these same problems.

You might consider all these advantages for your next construction job, and throw a few rolls of tape in with the rest of your standard equipment. The tape won't take up any room and may prove its value in applications that are yet to be discovered. END

Readers who would like to have additional information on the subject discussed in the foregoing article may request it by filling out one of the reader service cards in this issue.

books

Continuously Reinforced Concrete Pavement: Full-Scale and Model Tests. Bulletin 181. *Presented at the Thirty-Sixth Annual Meeting, January 7-11, 1957. Published by Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. 20 pp. Illus. $0.60.*

The two papers contained in this bulletin were presented at the Thirty-Sixth Annual Meeting of the Highway Research Board under the sponsorship of the Committee on Rigid Pavement Design.

The first paper, by Wayne R. Woolley, proposes certain design principles based on experience gained from existing continuously reinforced concrete pavements. Approximately 0.5 percent of steel will not break and the frequent cracks formed in the concrete are narrow enough to give many years of satisfactory service with very little maintenance.

The second paper, by R. L. Schiffman, I. J. Taylor, and W. J. Eney, is a preliminary report on the construction procedures and investigatory details of two experimental continuously reinforced concrete pavements constructed by the Pennsylvania Department of Highways.

Building Codes — Compilation of Standards. *Published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania. 1060 pp. $8.00.*

This volume, containing over 200 standards in their latest form, is a completely new edition of the compilation of ASTM standards found in building codes first published in 1955. It includes 18 standards not previously included in the original 1955 edition or its 1956 supplement.

Building codes throughout the United States and Canada have adopted, by reference, a large number of ASTM standards as authentic criteria of quality and established procedures for building materials and construction. Ordinarily these standards are scattered among the several volumes of the Book of ASTM standards. Therefore, in combining all such reference standards under one cover, this compilation should perform a

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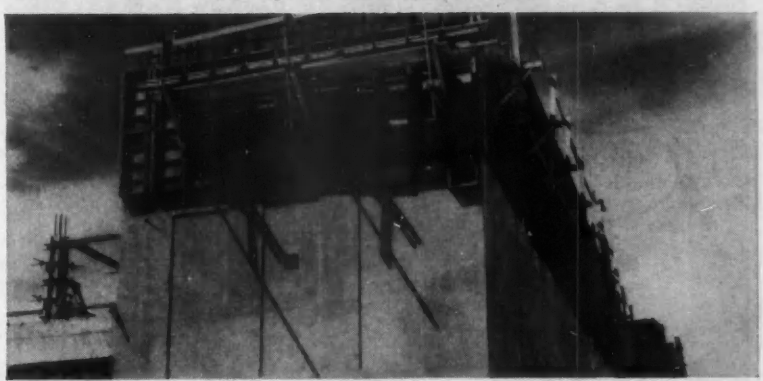
Sewage Plant . . . Two digestors and two filter tanks with wall heights from 8 to 23 feet formed with 12,000 square feet of Symons Forms.



60' High Bin Section . . . 8,500 square feet of Symons Forms were used on walls, slabs and stairways of sewage treatment plant.

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valuable service for those interested in all types of building materials. It is believed that this compilation will be useful to state and municipal agencies concerned with the effective administration of building codes, to architects, specification writers, engineers.

Philosophy of Structures. *By Eduardo Torroja. Translated by J. J. Polivka and Milos Polivka. Published by University of California Press, Berkeley 4, California. 416 pp. Illus. $12.50.*

This book offers the reflections on structural design of one of the world's great engineers and architects, Eduardo Torroja. Systematic but nonmathematical, the volume discusses the basic concepts and ideals of advanced structural design in a manner that will be useful and stimulating for laymen, students of engineering and architecture, and professionals. Its numerous illustrations show works that may be inspected in many parts of the world besides the author's native Spain.

Torroja covers many factors involved in the designer's art: the nature of stresses in different types of structures; the proper use of materials; structural elements such as supports, walls, arches, vaults, domes, beams, slabs, trusses; design of retaining structures, roofs, floors, bridges, and aqueducts; construction methods in their influence on design and cost; genesis of the structural scheme; the role of calculations and experimental stress analysis; the function of the designer in the construction enterprise as a whole.

The volume will be thought-provoking for anyone seeking to understand the creative thinking that is transforming contemporary building techniques. Although its primary purpose is to elucidate principles that are basic to any kind of building, its analyses of remarkable thin-shell roofs, gravity and arch dams, dramatic bridges, "hung" roofs, and other novel structures make it an important document in the history of modern architectural design and an inspiration for the creation of new, more organic, and more economical structural types.

equipment tools materials

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Tax Computer

A device has been designed to cut the time required to prepare weekly payrolls. It shows withholding tax and the new 2½ percent social security deductions all on one line for wage brackets up to $250. There are no pages to turn, no calculations to perform, and no special skill is required to use it. The plastic slide is moved to the desired wage bracket and the figures copied off. Replacements are available as tax rates change. Write **Calcu-Tax Corporation, 49 West 37th Street, New York 18, N. Y.**

Steel Door Frame

Quick installation by any carpenter, smooth contour surfaces to reduce painting costs, and rubber bumpers on strike jamb to provide silent operation are said to be features of Kewanee's Universal Kwik-Fit steel door frame which resembles ranch trim. The frame installs over drywall and is available for swing doors and sliding wardrobe doors. No sanding or nail hole filling is required. It is available for several thicknesses of drywall and in sizes to accommodate all standard doors. Write **Kewanee Manufacturing Company, Kewanee, Ill.**

Bonding Agents

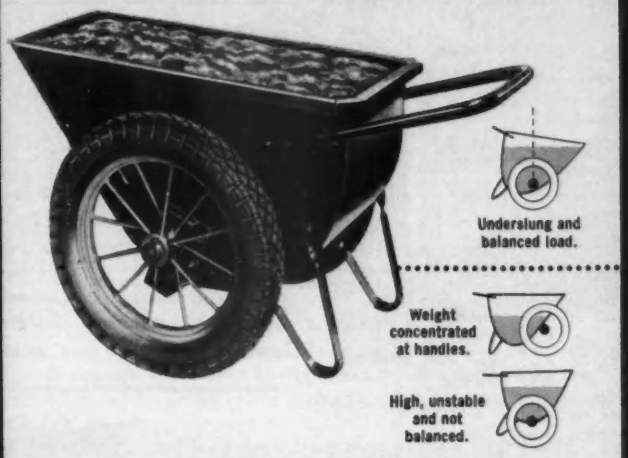
For contractors not yet familiar with Weld-Crete, Plaster-Weld and Tile-Weld, new half-pint packages will provide an ideal trial size. These small quantity packages will also be convenient for patching and touch-up jobs. Write **Larsen Products Corporation, P. O. Box 5756S, Bethesda 14, Md.**

Floor Coating

Penntrowel is a thermosetting coating which resists strong acids, alkalis, and solvents, withstands high temperatures and supports heavy traffic, according to the manufacturer. It is available in three grades to meet specific requirements and is packaged in convenient sizes for easy mixing of correct proportions of resin, filler and hardener. The mixture has a butter-like consistency and can be troweled on either horizontal or vertical concrete, brick, or cement block surfaces, forming a bond stronger than the surface being covered and sealing out moisture so no scaling occurs. It is applicable to all types of plant floors, walls, foundations and piers. Write **Pennsalt Chemicals Corporation, Three Penn Center, Philadelphia 2, Penna.**

designed WITH CONCRETE IN MIND

GAR-BRO CONCRETE CART



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Dodson's Digest

Bridge Deal

As I headed home recently from an extended trip outstate, I stopped at a detour. A bridge construction crew was replacing old wood abutments with concrete so I decided to have a look.

"Hi!" I shouted, walking up. "Name's Dodson. What's up?"

"Hello," called a heavy-set man. "I'm Otto Molmen. We bid low on this job . . . *too* low, the way things are going."

"Sounds like trouble," I ventured. "How long you been on it?"

"Two weeks now . . . and we haven't even gotten a good start," he said, disgustedly. "What's *your* line?"

"Calcium Chloride," I answered. "Maybe I can help you."

"Now don't get me wrong, Dodson," he said firmly, "but if there's one thing I *don't* need, it's more expenses! Be lucky to break even."

"One way to cut costs is to get the job done sooner," I remarked.

"Right," he replied, "but . . . "

"Okay," I broke in. "With Calcium Chloride in your mix you'll *save* money. Not only will it reduce set time by more than half so you can finish up sooner, but it also minimizes chipping and cracking. With Calcium Chloride you get higher early *and* final strength, too. Now, if I were you, I'd . . . "

"Sounds logical," he interrupted. "I'll get some tomorrow."

"Nothing doing!" I insisted. "Get to a phone right now, and call your ready-mix man . . . tell him on the next truckload to add two pounds of Calcium Chloride for each sack of cement."

"What's the rush?" Otto asked.

"Oh, nothing," I grinned. "Only that I've got to make this trip again next month . . . and this bridge will save me 40 miles of driving!"

— L. D. Dodson

P.S. — If you want to bolster your cold weather profits, send for your free copy of our booklet, "How To Make Better Concrete Products and Ready Mix." *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

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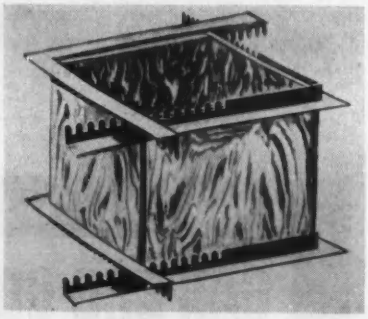
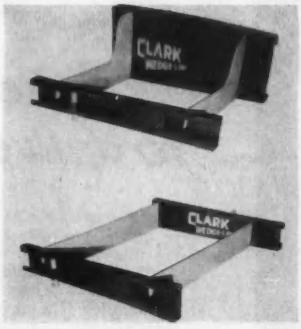


Column Form Clamps

A hammer is the only tool needed to set these steel form clamps for square or rectangular concrete columns measuring from 10 by 10 inches to 24 by 24 inches or any combination of these dimensions. One clamp is placed above another, around the forms. Larger sizes are available on request. **Deslauriers Column Mould Company, 5036 West Lake Street, Chicago 44, Ill.**

Reinforcing Steels

The combined height of KSD-TV's new television tower and antenna tower near St. Louis is 1152 feet. Reinforcing bars for the six concrete anchors and the tower foundation were shop fabricated and welded to insure accuracy and high strength. Complete reinforcing assemblies were delivered to the job site ready for placement in forms. **Laclede Steel Company, Arcade Building, St. Louis 1, Mo.**



Curb and Gutter Forms

Wedge-Lok slide connector permits removal of any section of these curb, gutter and sidewalk forms without disturbing adjacent units. Each 10-foot section has 3 stake pockets, with division plate slots placed at 12-inch intervals. Alignment of stake pockets and bolt holes allows stacking of forms to pour variable depth concrete. **Clark Industries, Construction Equipment Division, 375 East Fifth Avenue, Columbus, Ohio.**

Dustless Utility Drill

An air hammer which inhales dust and chips provides a solution to dust problems in drilling concrete, brick, plaster and other masonry. The hammer sucks in drilling dust through the hollow drilling steel and it is moved out ports in the back head of the tool and into special dust-extracting tanks. **Thor Power Tool Company, Prudential Plaza, Chicago 1, Ill.**

equipment and tools

For additional free information mail inquiry card on page 12B.

Plastic Repair Material

A new chemical-resistant plastic, Morpro Plastic Floor, that can be applied to wet surfaces offers a solution for floor and wall repair problems in plants, industrial concerns and institutions. It can be poured like syrup or trowelled, and is set for foot traffic within six hours and for heavy traffic overnight. It is mixed from a package that contains plastic, activator and aggregate. The manufacturer recommends it for patching, resurfacing and repointing and states that it permanently welds such materials as concrete, brick, granite, glass, ceramics, cinder block, cement, wood and most other plastics and sets stronger than the material it joins. This thermosetting plastic is also available as a paint in various colors. Write **Moore Maintenance Products, Haddonfield, N. J.**

Form Accessories

A new nut washer assembly, just added to a line of forming accessories, consists of two ¾-inch outside stud rods and two nut washers. There are 10 inches of thread on the stud rods so contractors can use lumber of various dimensions in forming. Nut washers spin on fast and can be drawn up tight with a combination wrench. Inside end of each stud rod has a 3-inch taper for easy removal and is threaded inside for a ½-inch tie rod. A new cone nut assembly is recommended when water tight walls and no exposed metal are specified. The nuts, with inside threaded rods, act as both spreader and tie. Cones are removed after stripping and the hole is grouted. Steel hex nuts for threaded tie rods are available for heavier jobs where no metal can be exposed and nuts can be left in concrete. Handle washers are optional equipment on either assembly. Stud rods, washers and cone nuts are reusable. Write **Dayton Sure-Grip and Shore Company, 302 Kercher Street, Miamisburg, Ohio.**

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Field-experienced BEAVER-ADVANCE engineers are readily available to supply you with working plans, bills of material and job estimates —with scaffold stocks for sale or rental available through 68 ADVANCE distributors conveniently situated in principal construction centers throughout the United States.

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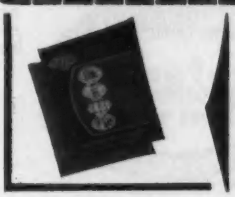

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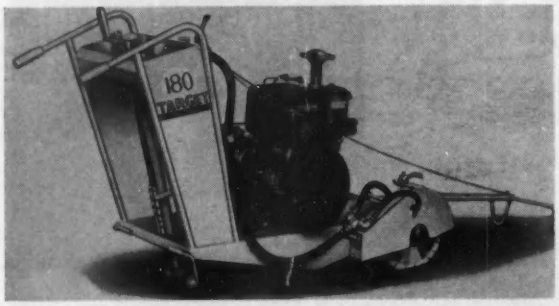
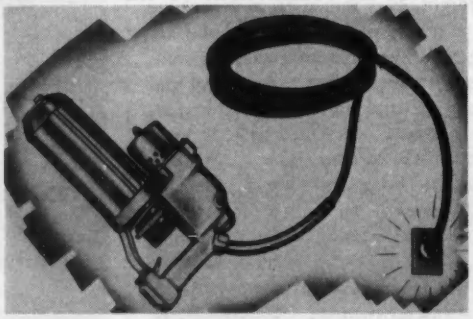


Concrete Saw

This 18 HP concrete saw is light and swiftly maneuverable to make short work of repair and patch jobs—yet with the power and rugged design to handle large construction projects. The manufacturer also markets a 7½ HP model. Both models are equipped with Target positive lock-type screw feed which provides fast, accurate lowering and raising of the blade, and prevents back-off of the blade in heavy sawing. Four solid, non-castering wheels hold the blade square on the cutting line on sidehill sawing or on uneven surfaces. **Robert G. Evans Company, 6024 Troost Avenue, Kansas City 10, Missouri.**

Electric Hammer Drill

An electric hammer available in 1½ or 2-inch capacities and a 2-inch capacity electromagnetic hammer drill need no control boxes. Cables plug directly into power line. Conversion of alternating current to direct current is accomplished by an improved rectifying element inside the tool itself. Both units deliver 3,600 blows per minute for fast cutting, chipping and drilling in concrete, stone, brick, tile and other hard compositions and for easy drilling of concrete and masonry. **Syntron Company, 323 Lexington Avenue, Homer City, Penna.**



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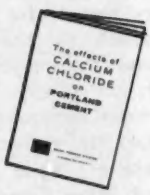

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equipment and tools

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Bonding Material

A new material is recommended as an additive to portland cement for patching. The molecular structure of the adhesive is different from that of other rubber-like cements, according to the manufacturer. It is described as a polymer with built-in adhesive characteristics. No resin or other tackifier needs to be added. Available as a laminating adhesive, the pressure-sensitive thermoplastic material bonds new synthetic films to all kinds of metals as well as to paper, wood, glass, plaster and other materials without heat or special surface treatment. Write **B. F. Goodrich, Akron, Ohio.**

Vapor Barrier Material

Using Glas-Kraft's vapor barrier, Rotbar, as a base a new material, Ply-Bar, has been produced by the firm. Ply-Bar incorporates the added advantages of a continuous sheet of polyethylene permanently bonded to Rotbar through an additional coating of a specially compounded asphalt laminant. The resulting material is a strong polyethylene coated vapor barrier which can also be used for concealed flashing. Write **Glas-Kraft, Inc., Mill Street, Lonsdale, R. I.**

Water Repellent

Nacor invisible silicone water repellent is a colorless liquid which penetrates masonry surfaces up to 3/8 inch, waterproofing the pore walls, while permitting the surface to breathe freely. It is applied by spray or brush, and achieves maximum penetration within an hour. It is said to keep moisture from interior walls, prevent exterior chipping, cracking, frost damage, and oxidation. It is especially recommended for use over water cement paints and after sandblasting. Appearance of wall surfaces remains unchanged by the application of Nacor, according to the manufacturer. Write **National Asphalt Corporation, Cleveland 15, Ohio.**

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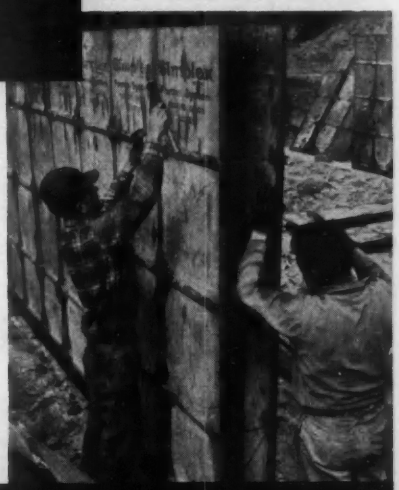

Contractor Norbert A. Paul, a builder in Billings, Montana, decided he could make more money by pouring his own home basements. Simplex proved his decision was right! With a standard set of Simplex 8-foot forms he poured 37 basements in one season and wound up with $4,675.32 in *extra profits*. He found Simplex Forms easy to handle . . . fast setting . . . easy to strip. And, Simplex gave him basement walls that were true and smooth. It's another example of success with Simplex. You, too, can go further ahead when you use "the world's fastest method of concrete forming."

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- 1⅛" Plastic Impregnated Plywood with thick outer plys that will not peel. Forms have been used over 200 times and still pour a smooth wall.
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2. Then consider how important safe, secure *watertight* concrete joints are.

3. Thorough watertightness *can* be secured by installing Labyrinth Waterstops —a dividend that makes the low initial cost of the product insignificant when compared to your total investment—and one that insures watertight concrete joints for years!

- Corrugated ribs grip concrete, insure an everlasting bond between joints.
- Finest polyvinyl plastic resists chemical action, aging, severe weather.
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If your aim is to stop water seepage, *stop it effectively with Water Seals' Waterstops!*

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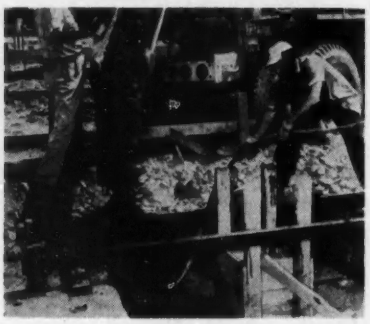
Slump Cone

Slump tests on concrete have been performed more efficiently with this seamless slump cone, according to the manufacturer. The cone is made of heavy gauge cadmium plated sheet steel and is constructed in one piece. The handles and foot clamps are welded in position and are also cadmium plated to resist rust. **Soiltest, Inc., 4711 West North Avenue, Chicago 39, Ill.**

Admixtures

Relying on their own admixtures for easily placed, durable concrete, Dewey and Almy Chemical Company specified them for the concrete mix for footings and foundation walls in their new $4,000,000 plant being built at Owensboro, Kentucky. As the truck discharges the concrete mix, it is vibrated causing it to consolidate thoroughly. **Dewey and Almy Chemical Division, W. R. Grace and Company, 62 Whittemore Avenue, Cambridge 40, Mass.**

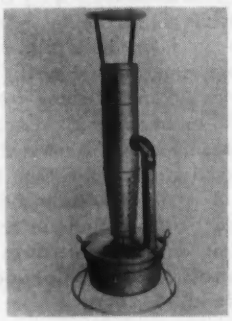


Hydro-Powered Conveyor

An all hydraulic drive for belt conveyors gives constant control of the belt at various speeds in both forward and reverse drive and positive locking of the drive pulley in neutral, according to the manufacturer. The conveyor elevates one-half cubic yard of concrete per minute and moves materials at speeds up to 220 feet per minute to heights of 28 feet. **Morgen Manufacturing Company, Yankton, S. D.**

Oil-Burning Salamander

This 5-foot high, portable oil-burning salamander maintains safe curing temperatures for concrete work in freezing weather. It has a large stack with a diffusion hood and is said to throw an effective volume of both radiant and convected heat in all directions. It is also recommended for providing warmth for workmen. **Scheu Products Company, 299 Stowell Street, Upland, Calif.**



equipment tools materials

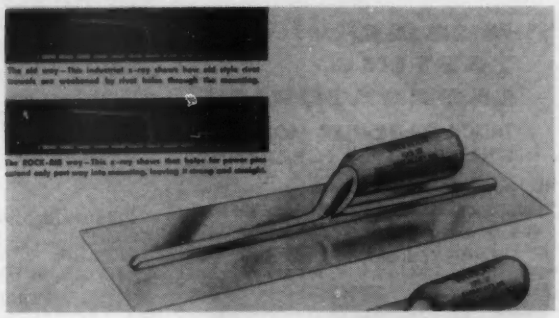
Additional free information concerning any item described in these columns may be obtained by filling out and mailing the postage-free reader service card located between pages 12 and 13 in this issue.

Field Office Trailer

A line of field office trailers include interior gloss finish, exterior paint, asphalt tiled floor, wiring system with circuit breakers, receptacles, fluorescent lights, oil heater with blower, doors and windows with metal screens and two telephone lines and three locations plus exterior pole installed. Many additional features are available and optional features may be added. Overall dimensions are 35 by 8 feet, 35 by 10 feet or 23 by 8 feet. **The Atlantic Trailer Corporation, 719 North Point Road, Baltimore 6, Maryland.**

Trowel

A flat, long-wearing trowel in a wide range of sizes is built without rivets. The blade is locked to the mounting with a new type of fastener called a power pin. Since no holes are drilled through the rib, the lightweight aluminum mounting is said to be stronger than the conventional mounting. Because no bucking of rivets is required, the finished blade is flatter. A stainless steel model is available for use where staining of white coats is a problem. **Goldblatt Tool Company, 1910 Walnut Street, Kansas City 8, Mo.**



Difficult Battered-Wall Tank Simplified With Gates

Army specifications on this 62′ diameter water storage tank called for the 24′-high wall to taper from 18″ at the base to 10″ at the top.

Using the Gates Vertical Rod System and color-coded PlastiCone ties, the contractor first erected the inside form to full wall height. Inside form bracing was minimized by using the heavy studs and shoring required to support a future concrete roof. The outside forms were "floated" to eliminate all exterior bracing, and the wall was poured in three 8′ lifts.

The contractor was well pleased and stated, "Gates produced the finest concrete and truest radius of any job I have ever done." This with an inexperienced crew . . . and Gates.

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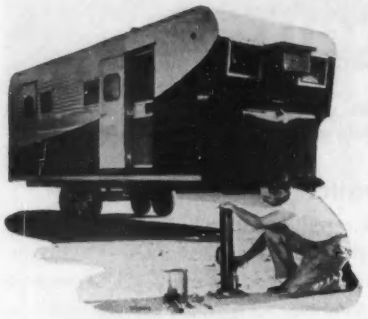
Water storage tank, Ft. Shaftner, Hawaii
U. S. Army Corps of Engineers
Contractor:
John Scully Company, Honolulu, T.H.

CC 1/59



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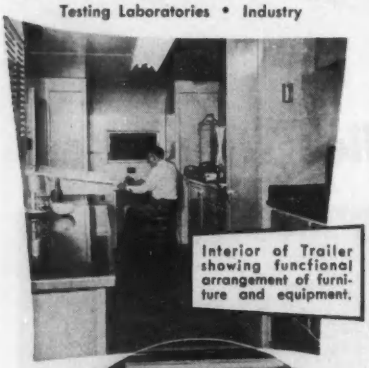

Interior of Trailer showing functional arrangement of furniture and equipment.

Truck interior shows comfortable working areas for Engineers and Technicians.

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literature

For additional free information mail inquiry card on page 12B.

Safety coating. How to eliminate dangerous slips on stairs, catwalks, ramps and other areas with Monroe X-L Veneer is explained in bulletin 1105. Colors in which the material is available are illustrated, and application and performance facts are given. The Monroe Company, 10703 Quebec Avenue, Cleveland 6, Ohio.

Using steel stakes. Diagrams illustrate this booklet on the use and application of solid steel stakes and accessories, and accompanying explanations tell how and where they can be used for maximum efficiency. A section gives maintenance tips. Dee Concrete Products Company, 670 North Michigan Avenue, Chicago 11, Ill.

Preserving wire rope. Service life of wire rope can be extended by eliminating excessive localized wear and damage, according to Service Bulletin No. 106. Users frequently discard lengths of otherwise serviceable rope because of localized damage. The bulletin lists all possible causes of these conditions and suggests corrections that will extend service life. H. K. Porter Company, Inc., Leschen Wire Rope Division, 2727 Hamilton Avenue, St. Louis 12, Mo.

Capping test cylinders. A material for capping test cylinders is described in Bulletin 482. The material is offered in dry form to be melted in the testing laboratory and sets to handling strength in less than one minute at room temperature and exceeds 10,000 psi within five minutes after pouring. Ultimate strength, reached within half an hour, exceeds that of concrete, regardless of age. Refractory Department, Denver Fire Clay Company, 3033 Blake Street, Denver 5, Colo.

Powder-actuated tools. The use of powder-actuated tools in highway construction is explained in a booklet. These tools harness the power of a fired cartridge to seat fasteners into a variety of non-brittle surfaces and into as much as an inch of steel. The booklet covers the use of the tools in fastening concrete forms used in bridge construction, in anchoring curb forms for highways and in fastening of conduit, concrete ties, drainage pipes and gutters. Ramset Fastening System, Olin Mathieson Chemical Corporation, 12117 Berea Road, Cleveland 11, Ohio.

Vibrating equipment. A line of motor-in-head vibrators, generators and related equipment is described in bulletin LL-1231. The vibrators are said to be powerful enough to handle 1 inch slump and up to 3 inch aggregate with ease. Concrete surfaces virtually free of pock marks result from the homogenizing action of high frequency, low amplitude vibration. The manufacturer also offers a compactor for granular soil compaction, a side form vibrator attachment, a full slab vibrator attachment and a pavement widening vibrator attachment which are pictured in use. Maginniss Power Tool Company, 154 Distl Avenue, Mansfield, Ohio.

Surety bonds. The importance of corporate surety bonds on private construction contracts is the subject of a new brochure which is being distributed to architects, engineers, owners, banks, and suppliers of labor and material by members of the National Association of Surety Bond Producers. Ellis, Smith & Company, Dallas, Texas.

Stadiums and Auditoriums. Case histories of concreting problems encountered and solved in stadium and auditorium construction are reported in Booklet MBR-P-12. Construction stories of 16 stadium and auditorium projects in this country and abroad cite the role played by Pozzolith in obtaining the desired handling properties of concrete during placement and in meeting exacting requirements for concrete in the hardened state. The Master Builders Company, 7016 Euclid Avenue, Cleveland 3, Ohio.

Winter liners for hats. Several types of winter liners for protective hats are pictured and described in bulletin 0602-2. These liners assure warmth and protection for construction workers during stormy winter weather. Mine Safety Appliances Company, 201 North Braddock Avenue, Pittsburgh 8, Pa.

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literature

For additional free information mail inquiry card on page 128.

Engineering equipment. A complete line of engineering equipment and supplies is described in two catalogues: Part I, Field Equipment and Part II, Drafting Supplies. Both catalogues contain full specifications and price lists and are available from Warren-Knight Company, 136 North 12th Street, Philadelphia 7, Penna.

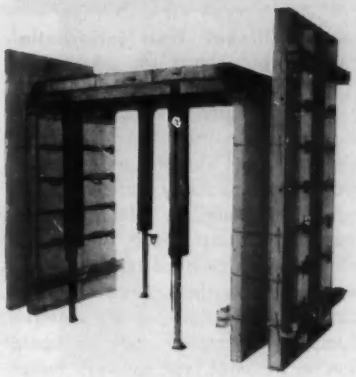
Portable space heaters. A complete line of portable space heaters is shown in bulletin No. 259. Included are 4 models of salamanders, 2 models of blower heaters and 3 models of infra-red heaters. Accessories are included. All are portable and are said to be safe and economical. Insto-Gas Corporation, 998 East Woodbridge Street, Detroit 7, Mich.

Grinding concrete. How to grind concrete, with information on proper accessories for both wet rubbing and dry grinding and on grinding concrete floors and ceilings, is explained in Form 5725. Stow Manufacturing Company, 354 Shear Street, Binghamton, N. Y.

Heavy duty flooring materials. A complete line of heavy duty flooring materials is described in bulletin No. 658. Text material explains the use and application of heavy duty emery aggregates, bricks, bonds and cures, and photographs illustrate each product. Information is also included on the mining and gradation of Cortland emery as an aggregate. Estimating data for each of the products is given. Walter Maguire Company, Inc., 60 East 42nd Street, New York 17, N. Y.

Exposed aggregate concrete. Folder RG 58 describes Rugasol, a chemical coating used during construction to obtain an exposed aggregate surface. It is provided in two types, the first for application on freshly placed plastic concrete and the second for application on formwork. The folder explains the methods for using both types, and pictures show surfaces obtainable. Sika Chemical Corporation, 35 Gregory Avenue, Passaic, N. J.

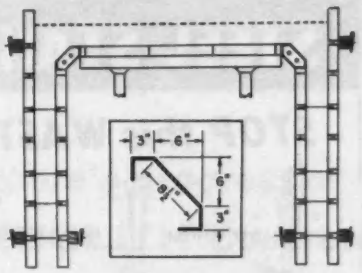
Culvert Forming



Symons Develops New Haunch Form for Culverts

Symons Safety Shores Used to Support Slab

Symons now has a new 9 x 9 inch steel haunch section designed to connect Symons standard wall panels and slab panels for the monolithic pouring of culverts. This new section provides for a 3-inch face on the roof slab and



on the wall with a 45-degree-angle surface 8½ inches wide between wall and roof. No built-up forms or other special equipment is necessary.

Made of 11-gauge hot rolled steel this new section is available in 4, 6, and 8 foot lengths. It can be used with either metal frame or wood frame forms. Symons regular form hardware is used for securing the steel section to Symons standard forms. No special fittings are required.

Symons forms, shores and column clamps may be rented with purchase option. FREE literature on Symons products is available upon request.

Symons

SYMONS CLAMP & MFG. CO.

4271 Diversey Avenue, Dept. A-9

Chicago 39, Illinois

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literature

For additional free information mail inquiry card on page 12B.

Power buggy. Folder PM 15C-1 illustrates with job-pictures the versatility of Model 15A Prime-Mover and provides specifications, dimensions and mechanical data. It features interchangeable dump bucket and flatbed which can be changed quickly on the same chassis without tools. One man can haul ¾ of a ton of any material. Compact dimensions allow its operation on the same type runways, ramps, hoists and towers that are used for hand carts. The Prime-Mover Company, Muscatine, Iowa.

Film on lime stabilization. A modern low cost method of road base construction is presented in a new 16 mm. sound-color movie entitled "Lime Stabilization of Roads." This 23-minute film shows line's use in stabilizing marginal clayey soils on projects ranging from Interstate freeways to farm-to-market roads, and includes city streets, airfields and shoulders. Typical construction procedures for both subgrade and base courses are shown. Reservations for showing the film by interested groups may be obtained by writing the National Lime Association, 925 - 15th Street, N.W., Washington 5, D. C.

Safety publications. "Book 8—Five Minute Safety Talks for Foremen" is a compilation of talks that appeared in earlier books in the series. "Rules for Safety" covers all phases of accident prevention. These publications are described in pamphlets available from the National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill.

Calcium Chloride solution. A 4-page brochure tells how to prepare standard calcium chloride solution either for large or small quantity usage. It contains a chart on recommended gallons of standard solution per batch, depending on the percentage of calcium chloride desired and cement per cubic yard of concrete. Calcium Chloride Institute, 909 Ring Building, Washington 6, D. C.

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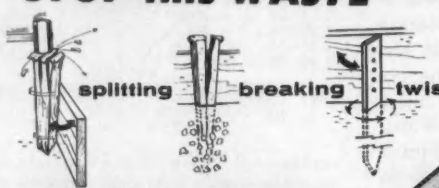

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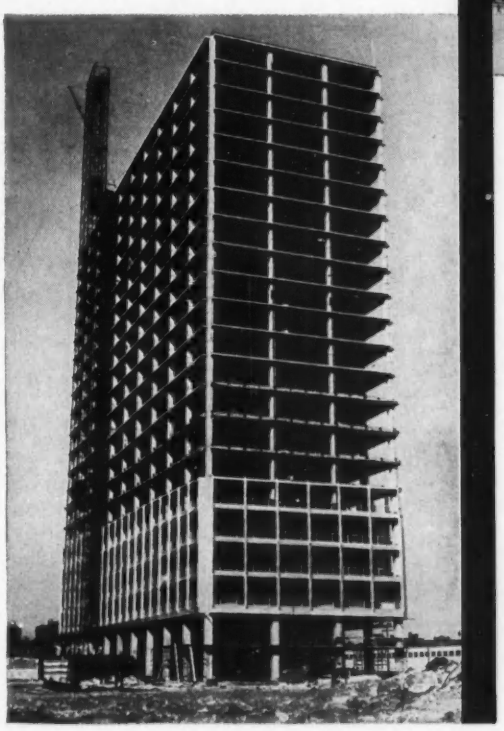

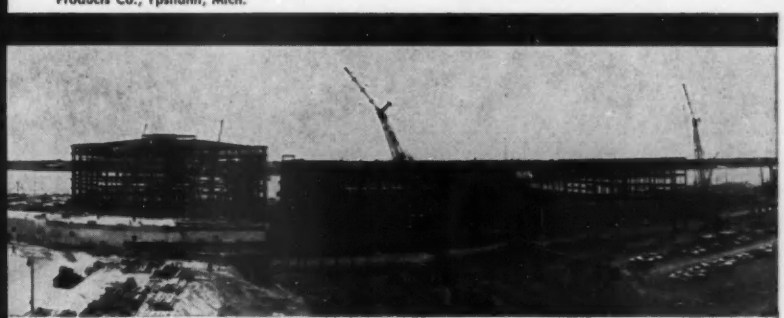

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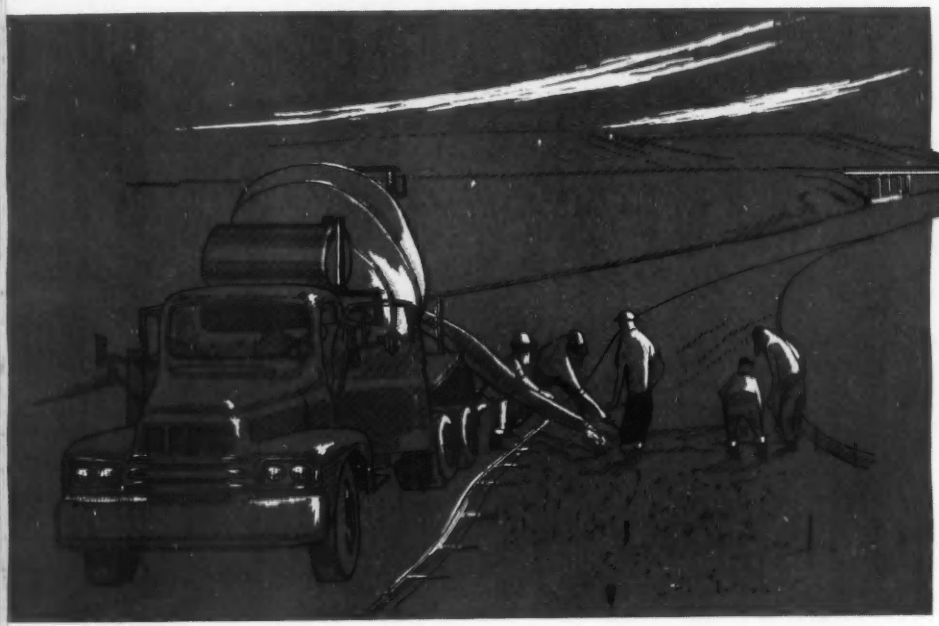
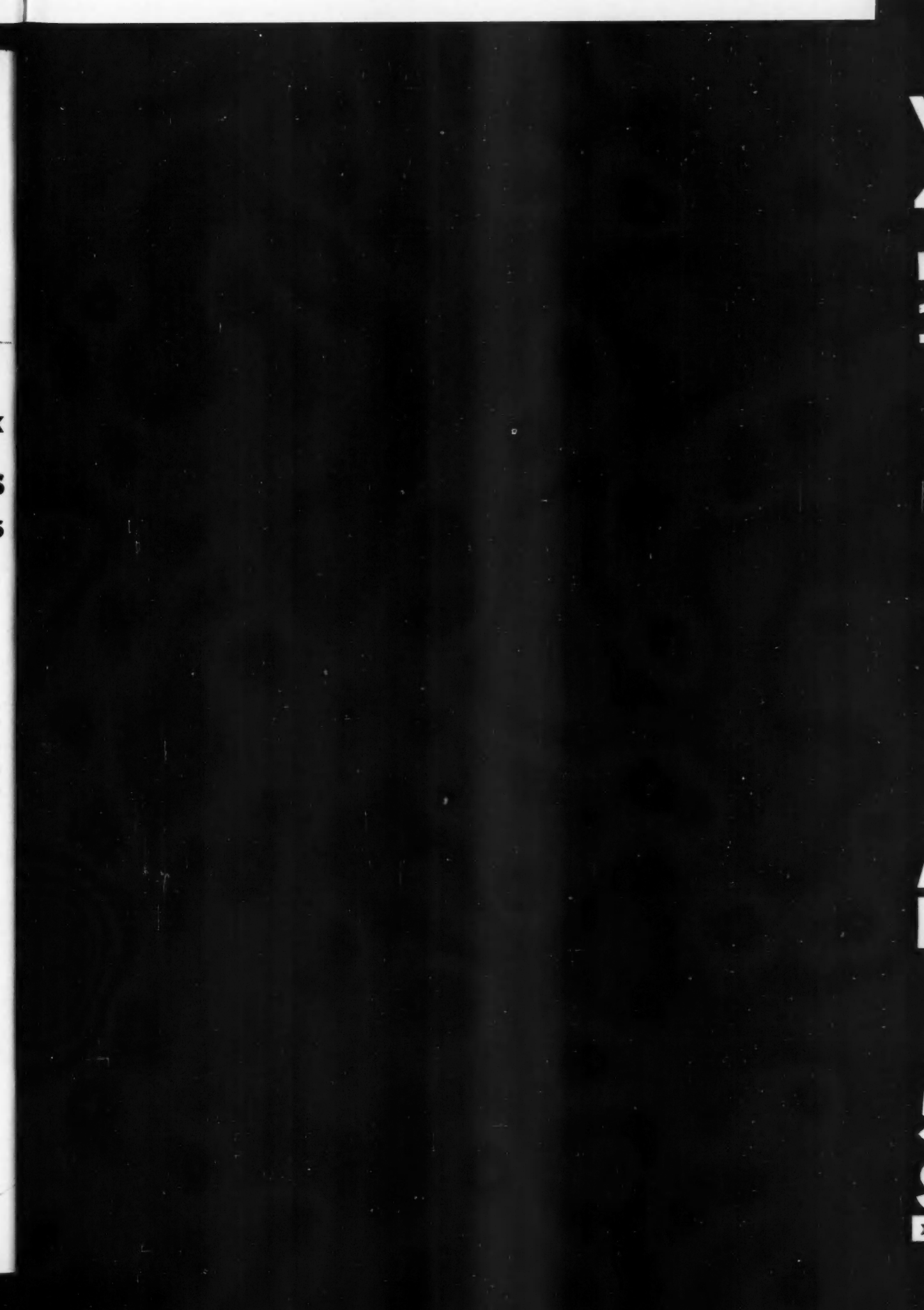


ready mix in streets and highways

One of the features of this issue of *Concrete Construction* is the first article in a series discussing the suitability of truck-mixed concrete for pavements. It starts on page 6, and we urge you to read it if you have any involvement or interest in the paving field.

The subject is admittedly complex, and we believe you will agree that the author has come to grips with it in an admirably forthright manner. Whether he convinces you or not in subsequent installments that ready mix offers the ideal solution to some of the thorny problems involved in the construction of modern pavements, we think you'll understand those problems better for having read his articles.

Street and highway construction, including bridges, culverts and other auxiliary structures, is already a most important market for ready mixed concrete, accounting in a recent statistical study for almost 12½ percent* of our industry's output. The only ready mixed concrete markets that exceed it in volume are home building, commercial construction and industrial construction, in that order. We believe that many factors are at work today to increase the utilization of our product in pavements, and that we have the means at hand now to solve any of the problems that might have prompted engineers to resist this trend in the past.

*From a study of the production and value of ready mixed concrete in 1957, conducted by the National Ready Mixed Concrete Association.

YOUR LOCAL PRODUCER OF READY-MIXED CONCRETE